

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroras were observed during the month as follows: 1st, South Canisteo, N. Y. 2d, Webster, Dak.; Montevideo, Minn. 3d and 4th, Webster, Dak. 5th, Fort Yates, Leech Farm, Webster, and Wolsey, Dak.; Embarrass, Wis. 6th, Webster, Dak. 13th, Leech Farm, Dak.; Embarrass, Wis. 14th, South Canisteo, N. Y. 18th, Kimball, Dak.; Newburyport, Mass. 19th, Lyons, N. Y. 20th, Fort Sully, Dak. 21st, Kent's Hill, Me.; Amherst, Mass.; Lyons, N. Y.; Northfield, Vt. 23d, Kent's Hill and Orono, Me.; Plymouth, N. H.; Lyons, N. Y.; Northfield, Vt. 26th, Egg Harbor City, N. J. 28th, Woodbury, N. J. 29th, Manitowoc, Wis. The more notable auroral displays are described as follows:

Fort Yates, Dak.: an auroral display was first observed at 11.40 p. m. of the 5th. It consisted of an arch, which was partly obscured by clouds, extending from azimuth 135° to 225° and to about altitude 15°. A few yellowish streamers rose from the arch. The display was last seen at 11.50 p. m.—*Report of George W. Scott, observer, Signal Corps.*

Fort Sully, Dak.: a distinct auroral display was observed at 9.45 p. m. of the 20th, and continued during the remainder of that date. The centre of the display was almost due north, and its principal light was of an intense yellowish red. The

display rose to about altitude 45°, and extended from azimuth 170° to 190°.—*Report of I. G. Gardiner, observer, Signal Corps.*

THUNDER-STORMS.

The more severe thunder-storms of the month are referred to under "Local storms." Thunder-storms were reported in the greatest number of states and territories, twenty-two, on the 12th; in thirteen on the 30th; in twelve on the 11th; in eleven on the 1st, 13th, and 27th; in nine on the 22d, 25th, and 31st; in eight on the 23d and 29th; in six or seven on the 2d, 15th, 26th, and 28th; and in from one to five from the 3d to 10th, 14th, 16th, 17th, 19th, 20th, 21st, and 24th. The 18th was the only date on which no thunder-storm was reported.

Thunder-storms were reported on the greatest number of dates, ten, in Illinois, Kansas, and Missouri; on nine in New York; on eight in Kentucky, Ohio, Pennsylvania, and Tennessee; on seven in Texas; on six in Arkansas, California, Colorado, Florida, Michigan, South Carolina, and Virginia; on from one to five, inclusive, in Alabama, Arizona, Connecticut, District of Columbia, Georgia, Idaho, Indiana, Iowa, Louisiana, Maine, Maryland, Massachusetts, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Oregon, Rhode Island, Dakota, Utah, Vermont, West Virginia, Wisconsin, and Wyoming. No thunder-storms were reported in Delaware, Indian Territory, Minnesota, and Washington.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for October, 1889, were made by Assistant Professor, H. A. Hazen, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, October, 1889.

States.		States.	
Maine.....	85.5	Tennessee.....	85.8
New Hampshire.....	82.9	Kentucky.....	85.5
Vermont.....	80.1	Ohio.....	80.7
Massachusetts.....	84.8	West Virginia.....	85.4
Rhode Island.....	87.0	Indiana.....	84.2
Connecticut.....	85.2	Illinois.....	84.6
Eastern New York.....	80.3	Lower Michigan.....	85.2
Western New York.....	86.6	Upper Michigan.....	82.1
Eastern Pennsylvania.....	82.3	Wisconsin.....	86.2
Western Pennsylvania.....	85.7	Minnesota.....	85.6
New Jersey.....	88.5	Iowa.....	85.6
Delaware.....	90.0	Kansas.....	79.7
Maryland.....	86.3	Nebraska.....	83.6
District of Columbia.....	86.5	Missouri.....	82.4
Virginia.....	85.9	Colorado.....	81.6
North Carolina.....	89.9	Dakota.....	82.3
South Carolina.....	92.5	Southern California*.....	80.3
Georgia.....	89.3	Northern California*.....	87.8
Eastern Florida.....	93.1	Oregon*.....	83.6
Western Florida.....	91.2	Washington Territory*.....	78.6
Alabama.....	87.8	By elements: Weather.....	89.5
Mississippi.....	83.6	Temperature†.....	79.4
Louisiana.....	86.2	Monthly percentage of weather and temperature combined†.....	85.5
Texas.....	88.2		
Arkansas.....	87.0		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10. ‡ The forecasts of temperature in districts east of the Rocky Mountains for October, 1889, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours, covering the second and third day in advance. Such forecasts are optional with the predicting officer, and are only made

when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 245; temperature, 45. Percentages of verifications: weather, 88.8; temperature, 94.7. Weather and temperature combined, 91.2.

Percentages of verifications of forecasts made for third day in advance. Number of predictions made: weather, 7; temperature, 1. Percentages of verifications: weather, 100; temperature, 100. Weather and temperature combined, 100.

CAUTIONARY SIGNALS FOR OCTOBER, 1889.

Statement showing percentages of justifications of wind signals for the month of October, 1889:

Wind signals.—(Ordered by Assistant Professor H. A. Hazen.) Total number of signals ordered, one hundred and nineteen; justified as to velocity, wholly, eighty-one, partly, five; justified as to direction, one hundred and ten. Of the signals ordered, ninety-six were cautionary, of which sixty-five were wholly, and one partly, justified; and twenty-three were storm signals, of which sixteen were wholly, and four partly, justified. Sixty-five signals were ordered for easterly winds, of which fifty-six were justified, and fifty-four were ordered for westerly winds, all of which were justified. Percentage of justifications, 69.7.

No cold-wave signals were ordered during the month.

Percentages of local verifications of weather and temperature signals reported by directors of the various State Weather Services for October, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois.....	88.0	78.8	Nebraska.....	79.4	88.0
Indiana.....	89.0	88.0	New Jersey.....	83.7	93.1
Kentucky.....	85.0	89.0	New York.....	80.7	87.6
Louisiana, northern.....	82.0	97.0	Ohio.....	87.0	83.0
Louisiana, southern.....	94.0	90.0	Oregon.....	68.0	75.0
Michigan.....	87.9	82.0	Pennsylvania.....	87.0	90.0
Minnesota.....	79.0	80.0	South Carolina.....	88.2	85.4
Missouri.....	87.0	89.0			